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Descriptions of some new species of fossils from the Devonian rocks of Manitoba.

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SECTION IV. 1890

TRANS. ROYAL SOC. CAN.

# DESCRIPTIONS OF
# SOME NEW SPECIES OF FOSSILS
FROM THE
DEVONIAN ROCKS OF MANITOBA.

By J. F. WHITEAVES.

FROM THE
TRANSACTIONS OF THE ROYAL SOCIETY OF CANADA,
VOLUME VIII, SECTION IV, 1890.

(ILLUSTRATED BY SEVEN PLATES.)

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III.—*Descriptions of some new or previously unrecorded species of fossils from the Devonian rocks of Manitoba.* (Plates IV. to X.)

BY J. F. WHITEAVES.

(Communicated May 28, revised Nov. 27, 1890.)

BRACHIOPODA.

STRINGOCEPHALUS BURTINI, Defrance.

(Plate IV.)

Strygocephalus Burtini, Defrance. 1827. Dict. des Sc. Naturelles, vol. li, p. 102, et Atlas, pl. lxxv, figs. 1, 1a.
Terebratula porrecta, Sowerby. 1827. Min. Conch., pl. 576, fig. 1.
Strigocephalus Burtini, Blainville. Malacologie et Conchyliologie, p. 511, t. liii.
Terebratula strigocephalus, V. Buch. 1834. Ueber Terebrateln, p. 117.
Strigocephalus giganteus, Sowerby (*Terebratula gigantea*, Sby., Encycl. Metrop.) Trans. Geol. Soc. Lond., 2nd series vol. v, 1837-39, pl. lvi, figs. 10, 11.
Strygocephalus Burtini, D'Archiac et De Verneuil. 1840. Trans. Geol. Soc. Lond., 2nd series, vol. vi, p. 393.
" *dorsatus*, De Verneuil. 1840. (*Strygocephalus dorsalis*, Goldfuss, Bonn Mus.) Ib., p. 369.
Strigocephalus Burtini, Phillips. 1841. Palæoz. Foss. Cornw., Devon & W. Somerset, p. 79, fig. 141.
" *giganteus*. Ib., p. 80, fig. 142.
Stringocephalus Burtini, F. A. Rœmer. 1850. Beiträge zur Kenntniss des Nordwestlichen Harzgebirges in Dunker und Von Meyer's Palæontographica, vol. iii, p. 24, pl. x, fig. 2.
Uncites iævis, McCoy. 1852. Brit. Palæoz. Foss., p. 380, pl. ii A, fig. 6.
Stringocephalus Burtini, Schnur. 1853. Beschreibung Eifel Brachiopoden, p. 195, pl. xxviii, fig. 5; pl. xxix, fig. 1, and pl. xxxi, fig. 1.
" " Davidson. 1856. Intr. Stud. Brach., p. 73, pl. vii, fig. 98, and French Ed., Mém. de la Soc. Linnéenne de Normandie, vol. x, p. 74, figs. 45-50.
" " Suess. 1853. Zur Kenntniss *Stringocephalus Burtini*, Verhandl. d. z. b. Vereins, iii, and German Ed. of Davidson's Introduction, 1856, pl. 1, fig. 16.
Stringocephalus hians, Sandberger. 1850-56. Die Versteiner. des Rheinisch. Schictensystems in Nassau, p. 309, taf. xxx, figs. 4 a-d.
Stringocephalus Burtini, Davidson. 1865. Brit. Dev. Brach., p. 11, pl. 1, figs. 18-22, and pl. ii, figs. 1-11.

In the 'Report of Progress of the Geological Survey of Canada' for 1874-75 (page 68) it is stated, on the authority of the late Mr. E. Billings, that "a brachiopod resembling Stringocephalus" was obtained by Mr. J. W. Spencer "on the western shore of Dawson Bay," Lake Winnipegosis, "from slabs apparently derived from the neighbouring cliffs." The specimen upon which this statement is based, which is still in the museum of the Survey, is an imperfect cast of the interior of a very young shell, rather more than an inch and a half in length, a little broader than long, and so badly preserved that its generic position could not be satisfactorily ascertained, though a small portion of the broad loop in the dorsal valve is exposed.

On the 30th and 31st of July, 1888, several specimens of a very large brachiopod, which, although imperfect and not very well preserved, were still obviously referable to the genus Stringocephalus, were collected by Mr. J. B. Tyrrell and the present writer from rocks of Devonian age on the north-western extremity of Lake Manitoba, at Monroe Point, on the west side of the mouth of Crane River, and at Pentamerus Point, three miles and a half further to the north.

In the following summer a remarkably fine series of specimens of the same species was obtained by Messrs. Tyrrell and Dowling from Devonian rocks at several localities on Lake Winnipegosis, but mostly from the islands or shore of Dawson Bay. These specimens, nine of which are represented on Plate IV, although often nothing more than mere casts of the interior of the shell, are not unfrequently in a fine state of preservation[1] and in several either the whole test or a very considerable portion of it is preserved.

The whole of the specimens collected from Lakes Manitoba and Winnipegosis, in the writer's judgment, are specifically identical with the *S. Burtini* of British and European authors. They present nearly all the variations in external form which that protean species assumes, and which Dr. Davidson illustrates in his "Monograph of the British Devonian Brachiopoda." The only appreciable characters in which the Manitoba specimens seem to differ from British or European ones are that in the former the loop in the dorsal valve is much broader proportionately, and the muscular impressions, which however are very indistinctly defined, were probably longer.

The largest of the specimens collected in 1889 (fig. 1) is about seven inches in its greatest breadth, and nearly five inches and three quarters in length. It is transversely subelliptical in outline and abnormally flattened.

The commonest forms of the species in Manitoba seem to be those which are either transversely subelliptical and much broader than long, or subsemicircular with the length and breadth about equal. Narrowly elongated examples, however, in which the length is much greater than the breadth, are by no means uncommon. The beak of the ventral valve is generally prominent and but little incurved, but the amount of its curvature is very variable. In some specimens (as in the originals of figs. 2 and 3) the beak of this valve is almost perfectly symmetrical, while in others it is distinctly curved, but indifferently to the right, as in fig. 4, or to the left, as in fig. 5.

A curiously distorted and flattened specimen from Monroe Point is essentially analogous to that form of *S. Burtini* from Plymouth which Davidson figures (op. cit., Pl. II, fig. 8) as one of the phases assumed by the *S. giganteus* of Sowerby. Another specimen, from Dawson Bay (fig. 6) represents an elongated and distorted form, with strongly recurved beak, strikingly similar to that which Davidson figures (op. cit., Pl. II, figs. 9, 9a) as the type of *Uncites lævis*, McCoy.

In those examples in which the test is preserved, as in the original of fig. 7, the sculpture of its outer surface consists of concentric lines of growth, which are crossed by faint radiating striæ.

The characters of the interior of the shell, also, are beautifully shown in many of the Manitoba specimens. Even the most imperfectly preserved casts of the interior of the closed valves show the narrow deep groove caused by the well developed septum of the ventral valve and the less deeply impressed groove made by the shorter septum of the dorsal. The whole course of the large cardinal process in the dorsal valve, up to the inner termination of the forked extremity with which it clasps part of the mesial septum in the ventral, can be traced with ease in many specimens, and more particularly in that represented by fig. 8, in which part of the beak of the ventral valve happens to be broken off sufficiently to expose it.

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[1] Some exquisitely preserved casts of the interior of this shell from Dawson Bay are not here figured, partly because they would have required a different kind of illustration to that adopted in this paper, and partly because the species has been so copiously illustrated elsewhere.

Most of what appears to have been the loop in the dorsal valve, is well exposed in two specimens from Dawson Bay, especially in the original of fig. 9, in which the whole of its front margin is clearly shown. In this specimen the loop is about three quarters of an inch broad in its broadest part and concentrically striated, but its posterior margin is everywhere imperfect, and shows no trace of any of the narrow shelly processes which Prof. Suess represents as radiating therefrom in European specimens.

The part of the shell which is least perfectly exhibited in the Manitoba specimens, is the cardinal area of the ventral valve, with its deltidium and foramen.

Two large specimens of a species of Stringocephalus which also appears to be indistinguishable from *S. Burtini*, were collected by Mr. R. G. McConnell in 1888, from the Devonian rocks at the "Ramparts," on the Mackenzie River.

In Europe the Stringocephalus or Givetian limestone, which is characterized by the presence of *S. Burtini*, has long been known to occupy a definite horizon in the Middle Devonian, immediately below the Cuboides zone, of which *Rhynchonella cuboides* is the characteristic fossil.

At Lakes Manitoba and Winnipegosis the species associated with *S. Burtini* appear to be as follows:—

Sphærospongia tessellata, Phillips (Sp.)
Pachypora cervicornis, Blainville.
Strophalosia productoides, var. membranacea.
Spirifera undifera, Rœmer.
Cyrtina Hamiltonensis, Hall.
Atrypa reticularis, L.
Atrypa reticularis, var. aspera.
Rhynchonella pugnus, Martin.
Pentamerus comis, Owen.
Actinopteria Boydii, Conrad.
Paracyclas elliptica, Conrad, small var.

Also the whole of the species described in the present paper, with the exception perhaps of *Gomphoceras Manitobense* and *Gyroceras submamillatum*.

At the "Ramparts," on the Mackenzie River, the following species were collected by Mr. McConnell from a band of shales about 100 feet thick, associated with *S. Burtini*, and identified by the writer. At this locality these shales are overlaid by about 150 feet of limestone, which latter forms the local summit of the Devonian system:—

Cyathophyllum arcticum, Meek.
Aulophyllum Richardsoni, Meek.
Cystiphyllum Americanum, var. arcticum, M.
Pachypora cervicornis, De Blainville.
Alveolites vallorum, Meek.
Hederella Canadensis, Nicholson.
Paleschara quadrangularis, Nicholson.
Chonetes Logani, var. Aurora, Hall.
Productella lachrymosa, var. lima.
Orthis striatula, Schlotheim.
Spirifera (Martinia) meristoides, Meek.
Cyrtina Hamiltonensis, Hall.
Atrypa reticularis, L.
Atrypa reticularis, var. aspera.
Rynchonella pugnus, Martin.
Rhynchonella castanea, Meek.
Pentamerus galeatus, Dalman, Var.
Rensselaeria lævis, Meek. Not Hall.
Paracyclas elliptica Conrad, large form.
Straparollus inops, Hall.

In these two lists it will be noticed that, counting one varietal form as a species, six species, viz., *Pachypora cervicornis*, *Cyrtina Hamiltonensis*, *Atrypa reticularis*, *A. reticularis* var. *aspera*, *Rhynchonella pugnus* and *Paracyclas elliptica*, are common to both.

MOLLUSCA.

PELECYPODA.

MODIOMORPHA ATTENUATA (N. Sp.)

(Plate V, figs. 1 and 1a.)

Shell large, attaining to a length of nearly or quite seven inches, much compressed laterally, especially in front of the midlength and below the middle, narrowly elongated, slightly curved and increasing gradually in height backwards to within a short distance of the posterior end. Anterior side short and regularly rounded; posterior side very long, slightly convex at its margin above, nearly straight but very shallowly concave below, its termination outward being apparently obliquely rounded above and narrowly rounded below: cardinal margin rounding downward abruptly at its posterior end: beaks small, depressed and placed at a short distance from the anterior end.

Surface markings and hinge dentition unknown. In casts of the interior of the shell there is a narrow longitudinal furrow on the hinge line of each valve, which extends from the beaks to the posterior end, where it curves obliquely downward for a short distance. At and in front of the midlength this furrow is deeper and much more strongly marked than it is posteriorly. Anterior muscular impression large, placed immediately in front of the beaks and a little below them: posterior muscular impression unknown.

Approximate dimensions of the most perfect specimen collected: maximum actual length, 17.6 centimetres or seven inches all but a line; greatest height, 5.7 cm., or two inches and a quarter, maximum thickness through the closed valves, 2.7 cm., or one inch and half a line.

South-east side of Dawson Bay, Lake Winnipegosis, four or five miles north of Shoal River, J. B. Tyrrell, 1889: one nearly perfect, and three very imperfect casts of the interior of the shell.

The specimen figured has a very small piece broken off the posterior end, but, if perfect, even without the test, it would almost certainly have slightly exceeded seven inches in length.

Although based upon very meagre material, the species, it is believed, can be recognized at a glance by its unusually large size and narrowly attenuated form, although it is by no means certain that it is correctly referred to the genus Modiomorpha.

MEGALODON SUBOVATUS (N. Sp.).

(Plate V, figs. 2, 2a, 3 and 3a.)

Shell large, moderately convex, somewhat compressed, very inequilateral, transversely subovate in marginal outline, about one fourth longer than high and broadly as well as somewhat obliquely subtruncated behind. Test extremely thick, especially in the cardinal region, in consequence of which the few specimens collected in which the test is preserved are considerably different in shape to casts of the interior of the valves, the condition in which the species is most usually met with.

The only specimens known to the writer in which the test is preserved are three right valves, all of which are imperfect at the posterior end. In these, the anterior side is very short and rounds abruptly into the ventral margin below. The posterior side, which is much longer than the anterior, is rather broad but narrows gradually both above and below, and is presumed to be somewhat obliquely subtruncated at the end, partly on the evidence of the lines of growth and partly by that afforded by some casts of the interior in which the posterior end is unusually perfect. The ventral margin is broadly rounded, but its curve is more convex anteriorly than posteriorly. The cardinal border, behind the beaks, is nearly straight but slopes very gently downward. The umbones are broad and rather tumid, but the beaks, which are placed very near to the front margin though not quite terminal, are small and curved inward, downward and very slightly backward.

The surface is nearly smooth and marked only with concentric lines of growth.

Casts of the interior of the shell are broader and shorter than those in which the test is preserved. The beaks in the former, too, are more acute and placed farther from the front margin, while their posterior umbonal slopes are rather strongly angulated.

The hinge is not well preserved in any of the specimens collected, but there appears to have been one large and prominent cardinal tooth in each valve, and a small, elongated but not much elevated and remote lateral tooth in the left valve, with a corresponding groove in the right. Anterior muscular impression large, rather deeply and rugosely excavated, with a slightly raised border on its posterior side, and situated at a short distance below the cardinal tooth. Posterior muscular scar about equal in size to the anterior but not so distinctly defined. Pallial line entire. In the central portion of the interior of each valve, a low rounded ridge runs obliquely backward from a short distance behind the beaks above, where it is well defined, towards the centre, where it gradually becomes obsolete and disappears.

Approximate dimensions of a right valve in which the test is preserved: maximum length, about 8.9 centimetres, or three inches and a half; height in the centre, 7 cm., or two inches and three quarters. Greatest thickness of the test 1.6 cm., or about five eighths of an inch.

Lake Winnipegosis, at several exposures on the west side and southern end of Dawson Bay, and three miles south of Graves Point, J. B. Tyrrell, 1889: three imperfect right valves and a number of casts of the interior of the shell.

This species is provisionally referred to the genus Megalodon on account of its strong resemblance in internal structure to the *M. truncatus* and *M. rhomboidalis* of Goldfuss, from the Devonian rocks of the Eifel. In these three shells, however, the hinge seems to be constructed on a somewhat different plan to that of the type of the genus, the *M cucullatus* of Sowerby. In *M. subovatus* the test in each valve is nearly as thick anteriorly, below the hinge, as at that part of the hinge itself, whereas in *M. cucullatus* the hinge plate is represented as abruptly reflected and sharp on its inner edge, so as to form a kind of partial deck over the inner surface of each of the umbones. Zittel[1] thinks that *M. truncatus* and *M. rhomboidalis* should perhaps be referred to Schizodus, but, in the writer's judgment, *M. subovatus* is very closely related to Megalomus. The late Dr. S. P. Woodward, in his "Manual of the Mollusca", regards Megalomus as only a subgenus of Megalodon, but Zittel follows E. Billings in making Megalomus a synonym of Cyrtodonta, and places the latter in the Arcadæ. It is quite possible that a new genus or subgenus may have to be constituted for the reception of the little group of species, including the present one, of which *M. truncatus* is the type, but it seems to the writer that the proper position of this group is in the family Megalodontidæ of Zittel and not in the Arcadæ nor Trigoniadæ.

ORTHONOTA CORRUGATA. (N. Sp.).

(Plate V, figs. 4, 4a, and 5.)

Shell large, attaining to a length of nearly six inches, very inequilateral, narrowly elongated and much flattened: length about four times the greatest height: thickness through the closed valves equal to about one half their height. Anterior side short, a little narrower than the posterior and regularly rounded: posterior side much elongated, increasing very gradually and slightly in height backward to its outer extremity, which latter is subangular and somewhat produced above, truncated rather obliquely inward in the middle and broadly rounded into the base below. Basal margin nearly straight, but very slightly concave a little in advance of the midlength: hinge line long, straight and occupying about five sixths of the entire length: beaks small, low, scarcely elevated above the hinge line, appressed and placed at a short distance from the anterior end.

Surface marked by concentric lines of growth, which are coarser and more distant around the anterior end than in the central portion of the valves. On the posterior area, in particular, they are developed into interrupted and more or less irregularly disposed corrugations, or narrow prominent ridges.[2] On casts of the interior of the closed valves the posterior area in both is bounded by a faint groove which extends obliquely backward from a short distance behind the beaks above to the posterior termination of the basal margin below.

Anterior muscular impression large and situated immediately in front of the beak and a little below it: posterior muscular scar unknown. Hinge characters also unknown, but, in casts of the interior, a long narrow and rather deep groove runs backward almost the whole length of the hinge line, in each valve, the two grooves being separated by a narrow raised ridge.

Approximate dimensions of the most perfect specimen collected: maximum length,

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[1] "Handbuch der Palæontologie," Band 2, p. 55.

[2] The mode of illustration adopted for this paper does not show these as clearly as could be wished.

15 centimetres. or not quite six inches; greatest height, 3.9 cm., or one inch and a half; maximum breadth or thickness, 1.7 cm., or a little less than three quarters of an inch.

Dawson Bay, Lake Winnipegosis, on the west side, at the mouth of the Red Deer River, also on the south-east side four or five miles north of Shoal River and on two small islands adjacent thereto, J. B. Tyrrell, 1889: a few casts or portions of casts of the interior of the shell, in some of which parts of the test are preserved.

This species is not at all likely to be mistaken for any other. It is most nearly related to the *O. undulatum* of Conrad, but is fully twice the size of that species, its ventral and cardinal margins are not parallel as they are in *O. undulatum*, and the corrugations on its posterior area are more interrupted and more irregularly disposed.

GASTEROPODA.

PLEUROTOMARIA GONIOSTOMA. (N. Sp.)

(Plate VI, fig. 1.)

Shell subturbinate, a little broader than high, with an angulated and step-shaped spire, which is much shorter than the outer volution: base moderately convex externally, depressed and deeply umbilicated in the centre. Volutions about four, increasing rapidly in size, those of the spire flattened above and laterally compressed, so that their outline is nearly rectangular: outer volution very broadly flattened above, especially at the aperture, angulated at its shoulder and narrowing convexly into the base below: umbilicus deep but not very broad (though its outer margin is rounded and indistinctly defined) and not exposing therein any part of the base of the inner volutions. Aperture a little higher than wide, concave on its inner margin and narrowly rounded below.

Surface markings consisting apparently of nearly transverse lines of growth. Band situated on the angle of the volutions, one half of it being above the angle and the other half below. The filled up sinuses of the band are represented by crescentic nodes, which gives the angle a crenulated appearance, and the band itself is margined both above and below by a raised line.

Approximate dimensions of the specimen figured: height, or length, as measured from the apex to a line drawn parallel with the base of the aperture, 6.0 centimetres; greatest breadth of the same, 7.3 cm.

South shore of Dawson Bay, Lake Winnipegosis, at various exposures from the mouth of the Red Deer River, to a point about five miles north of Shoal River, J. B. Tyrrell, 1889: one or two specimens from each of these exposures. One of these specimens has the test preserved, but the rest are moulds of the exterior of large shells, partly filled with dolomite except where the test which was once between them has decayed away. In the specimen figured, the spire is drawn from a wax impression taken from one of these natural moulds, and the basal half from the cast which fits into and forms part of it.

EUOMPHALUS MANITOBENSIS. (N. Sp.)

(Plate VI, figs. 2, 2a-b, and 3, 3a.)

Shell large, attaining to a maximum diameter of five inches and a half, or more, discoidal, depressed, spire sunk, the upper side being rather more deeply concave than the lower: umbilicus wide, open and exposing nearly the whole of the inner volutions. Volutions four, coiled on nearly the same plane and increasing rather rapidly in size: those of the spire depressed convex above and more convex as well as faintly angulated near their centre below: outer volution much broader from the suture to the periphery than laterally, somewhat flattened above, much more convex and obtusely subangular below, and rather narrowly rounded or more or less faintly angulated at the periphery: umbilicus, as measured from opposite points in the suture, occupying about one third of the entire diameter: outline of aperture usually broadly and somewhat triangularly subovate: though in some specimens, in which the outer volution expands somewhat near the mouth, the latter appears to have been not far from circular.

Surface markings not well preserved, but consisting, so far as can be ascertained, of lines of growth which curve obliquely and concavely forward, both above and below. On the periphery there is some reason for thinking that they were produced into a single series of narrowly convex lobes which projected forward.

Operculum, which in one specimen is preserved in place, calcareous, moderately thick, flat internally, slightly convex externally, circular in marginal outline, and multispiral.

Dimensions of an average specimen (the one figured): greatest diameter, ten centimetres, or about four English inches; greatest width of umbilicus as measured from two opposite points on the suture, 3.7 cm., breadth of aperture, from suture to periphery, 5.0 cm.; greatest height thereof, from upper to lower side, 4.2 cm.

Monroe Point, Steep Rock Point and north of Steep Rock Point, at the northern end of Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888. Collected also at numerous localities on the islands and shores of Lake Winnipegosis, especially in Dawson Bay, by J. B. Tyrrell and D. B. Dowling in 1888 and 1889. This species is one of the most abundant and characteristic fossils of the Devonian rocks at these two lakes. Four detached examples of its operculum have been collected and one specimen of the shell is so broken as to show its operculum in situ though a little displaced from its normal position.

CEPHALOPODA.

ORTHOCERAS (THORACOCERAS) TYRRELLII. (N. Sp.)

(Plate VII, figs. 1, 1a, 2, 3 and 4.)

Shell narrowly elongated, slender and increasing very slowly in thickness, outline of transverse section just behind the body chamber compressed polygonal, the general shape of the p

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Surface finely and closely striated across, and marked also by distant transverse plications and longitudinal raised ridges. The transverse plications are placed at an average distance of about one centimetre apart, and are separated by broad but shallowly concave constrictions. The longitudinal ridges, of which there are eleven or twelve in the entire circumference, are very narrow and extend the whole length, at any rate of the septate portion. At each of the points at which they pass over the transverse plications the longitudinal ridges expand and appear to have originally borne a short and slightly curved spine, though it is only the spine bases that are usually preserved. These latter appear as prominent, spout-like nodes which are arched forward and open towards the front.

Sutures of the septa nearly straight, placed at an average distance of about seven millimetres apart. Siphuncle placed in the centre of the margin of what would correspond to one of the flattened sides in the transverse section, partially disjointed and apparently more or less invaginated between the septa, each articulation increasing slightly in thickness anteriorly.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: one specimen. East side of Dawson Bay, Lake Winnipegosis, J. B. Tyrrell, 1889, at a point four or five miles north of the mouth of Shoal River (upwards of forty specimens), also on the west side, near the mouth of Steep Rock River (two specimens), and at the mouth of the Red Deer River (a few characteristic fragments).

The specimens collected consist of numerous casts of the interior or moulds of the exterior of the body chamber or of the septate part of the shell, or of both together, detached casts of the interior of the body-chamber being quite common. The only specimen in which any of the spines on the longitudinal ridges are preserved is the fragment from the mouth of the Red Deer River represented by fig. 4.

This remarkable species seems to belong to that group of the Orthocerata for which Fischer de Waldheim proposed the generic name Melia in 1829, though, finding this preoccupied, he changed it to Thoracoceras in 1844. Professor Hyatt, who follows Fischer, Eichwald and Chenu in regarding Thoracoceras as a valid and distinct genus, says that "it includes all those longicone species in which the ridges become spiny, or are roughened by the prominence of the transverse striæ or ridges."[1] The writer has much pleasure in associating with this shell the name of his friend and colleague Mr. J. B. Tyrrell, who has devoted the whole of the summer seasons of 1888 and 1889 to the elucidation of the stratigraphical relations of the rocks on the shores and islands of Lakes Manitoba and Winnipegosis.

ACTINOCERAS HINDII. (N. Sp.)

(Plate VI, figs. 4, 4a and 5.)

Shell rather large, cylindro-conical, narrowly elongated and increasing very slowly in thickness, especially near the body-chamber: outline of transverse section of the anterior end of the septate portion broadly ovate but very nearly circular, unless abnormally compressed as it generally is; body-chamber slightly swollen in the centre and as slightly contracted as well as very faintly constricted anteriorly, apparently short and about equal in length to its greatest basal diameter.

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[1] "Genera of Fossil Cephalopods." 'Proc. Boston Nat. Hist. Soc.,' 1883, vol. xxii, p. 275.

Surface markings unknown. Sutures of the septa placed at distances of from three to six millimetres apart, and closest together near the body-chamber, undulating and curved broadly forward on the siphonal and antisiphonal sides, and more narrowly backward on the two sides which correspond to the two ends of the ovoid seen in the transverse section: siphuncle (at least at the anterior end of the septate portion) slightly inflated between the septa and a little eccentric.

Snake Island, Lake Winnipegosis, Prof. H. Youle Hind, 1858: a piece of the larger end of the septate portion of the shell, which, when ground down, shows eight septa and the exact shape and position of the siphuncle. Several much more perfect and in some respects more characteristic examples of this species were collected by Messrs. Tyrrell and Dowling in 1889, at Snake Island and numerous other localities on the islands and shores of Lake Winnipegosis. The larger of the two specimens figured, which measures 4.7 centimetres or one inch and seven eighths in maximum thickness, is from the north side of Manitou Island. A few specimens of what appears to be an unusually slender variety of this species, were obtained by Mr. Tyrrell and the writer in 1888 at Onion Point, near the north end of Lake Manitoba.

In the slightly beaded character of its siphuncle this species seems to be intermediate between Actinoceras proper and Orthoceras. It probably belongs to that aberrant group or section of the Actinoceratidæ for which Hyatt has proposed the name Sactoceras, though it should be borne in mind that, as Barrande pointed out long ago in his *Orthoceras*, or as it would now be called by most, *Actinoceras docens*, the siphuncle may be strongly nummuloidal at the posterior end and only slightly beaded at the anterior end of the septate portion of the same specimen.

In its external characters *A. Hindii* closely resembles the *Orthoceras laterale* of Phillips, but, in the first part of Mr. Foord's "Catalogue of the Fossil Cephalopoda in the British Museum," that species is referred to Orthoceras rather than to Actinoceras, and hence it presumably has a simply cylindrical siphuncle. It is, perhaps, more closely related to the *Actinocerus Sowerbyi* of McCoy, (which is the *Orthoceras undulatum* of Sowerby but not of Schlotheim) from the Carboniferous rocks of England, but in that shell the sutures are more oblique and the siphuncle nearly marginal.

The specific name here proposed for the present species is given in honour of Professor Henry Youle Hind, of Windsor, Nova Scotia, one of the earliest explorers of the Devonian rocks of Manitoba.

GOMPHOCERAS MANITOBENSE. (N. Sp.).

(Plate VII, figs. 7 and 7a.)

Shell rather large and robust, about twice as long as broad, subfusiform but slightly curved at the posterior end, and straight in the middle and anteriorly: ventral[1] margin broadly convex, gibbous behind the midlength: dorsal margin faintly inflated a little behind the centre and apparently somewhat concave posteriorly : sides slightly compressed, the outline of a transverse section near the middle being broadly elliptical, with the lateral diameter about one seventh less than the dorso-ventral: body-chamber short, much broader than long and occupying about one third of the entire length, narrowing slightly towards and up to the anterior end, which appears to have been broadly truncated: characters of the aperture unknown, though, so far as can be judged from the most perfect specimen collected, it seems to have been large, simple and entire.

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[1] In a paper published in the Transactions of this Society for 1889, the convex sides of *Poterioceras apertum Oncoceras magnum*, *O. gibbosum* and *Cyrtoceras Manitobense* were inadvertently described as dorsal and their straighter sides as ventral, in accordance with the old terminology. In the present paper the more modern view will be adopted and the convex sides of this and of the five following species will be regarded as ventral, and their concave sides as dorsal.

Surface apparently smooth. Sutures of the septa nearly straight, but very faintly convex on the venter, where they are much farther apart than on the dorsum: siphuncle lateral (?) and placed in the centre of the margin of one of the sides.

Approximate dimensions of the specimen figured, which is not quite perfect at the posterior end: actual length not quite five inches, but when perfect probably about five inches and a half, or fourteen centimetres; maximum dorso-ventral diameter 7.5 cm.

About a dozen specimens of this species and a few fragments were collected by Messrs. Tyrrell and Dowling in 1889 at several localities in and around Lake Winnipegosis, as on Snake and Manitou Islands, at its southern end, and at Point Wilkins and the mouth of the Red Deer River, in Dawson Bay, at its northern extremity. These specimens are mere casts of the interior of the shell, most of which are abnormally compressed and in very poor condition. To a few of these casts small portions of the test are still adherent, but the surface ornamentation is not at all well preserved. Only one specimen shows any remains of the siphuncle and in that its exact position is not at all satisfactorily exhibited.

This species is rather doubtfully referred to the genus Gomphoceras, on account of its general resemblance to the *G. eximium* of Hall, though the anterior end of its body chamber appears to the writer to be more like that of Poterioceras. It seems to differ specifically from *G. eximium* in its smaller size, and in the greater and more abrupt curvature of its posterior end, though, as this latter character is seen only in the specimen figured, it may not be a permanent one. A fragment of a Gomphoceras, which probably belongs to this species but which is too imperfect to be determined with any certainty, was collected by Prof. H. Youle Hind in 1858 at Snake Island.

CYRTOCERAS OCCIDENTALE. (N. Sp.).

(Plate VII, figs. 5, 5a and 6.)

Shell rather large, attaining to a length of upwards of eight inches, elongate conical, very slightly curved and increasing very slowly in thickness up to the commencement of the body-chamber, which is rather short and narrows very slightly towards and up to the aperture : outline of transverse section of the thickest part of the septate portion circular.

Surface apparently almost smooth or only faintly striated across, although in one cast of the interior there are distinct traces of very faint longitudinal ribs. Sutures of the septa placed at distances apart of about four millimetres at a short distance from the narrow posterior end, where the diameter is from twenty to thirty-three mm., and about six near the body-chamber, nearly straight but very slightly convex and arched gently forward on the venter or convex side, somewhat oblique and curving very gradually backward on each side, and faintly undulated on the dorsum, a feebly developed saddle, with a correspondingly shallow and inconspicous sinus on each side, marking the place where each suture passes over the siphuncle. Siphuncle nummuloidal, endogastric, placed in the centre of the dorsum and close to its margin.

Lake Winnipegosis, at the north end of Snake Island, and at four exposures on the west and south-east of Dawson Bay, J. B. Tyrrell and D. B. Dowling: seven more or less imperfect specimens and a few detached pieces of the siphuncle. The largest specimen collected, the only one in which any of the test is preserved, is not figured as it is unfortunately too imperfect in the ventral region or convex side to show the lateral outline well. It is, however, nearly perfect in the dorsal region and measures 21.5 centimetres or eight inches and a half in length, while its maximum thickness is about 5.3 cm.

HOMALOCERAS. (Gen. Nov.).

Shell consisting of a slender tube which is broadly and strongly arcuate, curved in the same plane and much flattened laterally, its venter or outer border being very narrow, truncated, and depressed in the centre. Sutural line consisting of two very narrow saddles with an equally narrow sinus between them on the venter, a broadly concave sinus or lobe on each of the sides, and a rather narrow saddle on the dorsum: siphuncle, in the only species known, cylindrical, exogastric and placed near the venter or outer and convex margin. Body-chamber long, occupying about one third of the entire length.

This genus seems to differ from any that the writer is acquainted with, in its extremely narrow, truncated and depressed venter, in the outlines of its sutures, and in its strongly arched and ultimately somewhat recurved shell. It is doubtful to which of the families described by Professor Hyatt in his "Genera of Fossil Cephalopods" it should be referred, though the writer is inclined to regard it as an extremely aberrant member of the Hercoceratidæ. It is quite possible, also, that in the description of this and the following genus some of the characters regarded as of generic importance may prove to be only specific, and *vice versâ*.

HOMALOCERAS PLANATUM, sp. nov.

(Plate VIII, figs. 1, 1a-d.)

Shell rather large, increasing very slowly in breadth and in its dorso-ventral diameter, so broadly curved that its convex borders each form rather more than a semicircle when viewed sideways. Sides obliquely compressed, the greatest lateral or transverse diameter being only one half that of the dorso-ventral: venter or outer and convex border slightly raised, angular and crenate on each side, the extremely narrow and depressed space in its centre being occupied with a single row of oblong or oval shallow pits: dorsum or inner border narrowly rounded, the inner half of the sides being considerably wider than the outer. Surface markings unknown, apart from those of the venter, as are also the characters of the aperture.

South-east side of Dawson Bay, Lake Winnipegosis, four or five miles north of Shoal River, J. B. Tyrrell, 1889, one imperfect but characteristic specimen and three fragments. The former consists essentially of a natural mould of nearly the whole of one side of the shell, with parts of the septa and siphuncle preserved at the posterior end, and with a natural cast of nearly the whole of the body-chamber loose but *in situ* at the anterior end. In fig. 1 on Plate VIII, the septa nearest the body-chamber are restored from another specimen. Figures 1a and 1b on the same plate were drawn from an impression in wax taken from near the posterior end of the original of fig. 1. In the cast of the interior of the body-chamber the venter is continuously and longitudinally grooved, as shown in fig. 1d, which represents the outline of the posterior end of the chamber of habitation as viewed from behind.

TETRAGONOCERAS. (Gen. Nov.).

Shell subspiral, recurved, coiled loosely on the same plane in such a way as to make a little more than one very lax volution which becomes nearly straight anteriorly: outline of transverse section quadrangular, with the dorsoventral and lateral diameters about equal: siphuncle, in the only species known, cylindrical, exogastric, marginal and placed in the middle of the venter.

The above generic name is here proposed for the reception of the shell represented by figs. 2, 2a-b, on Plate VIII, which, though strongly curved like some species of Cyrtoceras, is distinctly quadrangular in transverse section. The *C. tetragonum* of d'Archiac and de Verneuil, is, it is true, also quadrangular in section, but Professor Hyatt, who refers that shell to his genus Centroceras, says that it is a true close coiled Nautiloid.

TETRAGONOCERAS GRACILE, sp. nov.

(Plate VIII, figs. 2, 2 a-b.)

Shell very slender, increasing slowly in thickness: outline of transverse section near the midlength nearly square but slightly trapezoidal: venter shallowly concave with an acutely angular and slightly elevated border on each side, a little broader than the dorsum: sides flattened, nearly straight but narrowing gently inward: dorsum slightly convex.

Surface markings and characters of the body-chamber unknown. Sutural line rather oblique, faintly concave on the venter and ventral half of the sides, and as faintly convex on the dorsum and dorsal region.

West side of Dawson Bay, Lake Winnipegosis, near the mouth of Steep Rock River, J. B. Tyrrell, 1889: one specimen imbedded in a piece of rock which has been so broken as to show nearly the whole of the characters of the interior of the septate portion of the shell, as well as the general shape of the latter.

GYROCERAS CANADENSE. (N. Sp.).

(Plate IX, figs. 1, 1a-c and 2.)

Shell involute, robust, coiled so closely on the same plane that the volutions were originally in contact except, perhaps, close to the aperture, but without embracing. Volutions apparently decollate posteriorly, leaving a very small space empty in the centre, the one and a half remaining increasing more rapidly and much broader in their lateral diameter than in their dorso-ventral, depressed convex on their ventral or outer border, inflated or expanded at the sides, and nearly flat in the dorsal region : outline of transverse section at the commencement of the body-chamber transversely sub-elliptical but in some specimens obscurely polygonal. Body-chamber rather short, occupying not much more than one third of the outer volution.

Surface marked by transverse, closely disposed, minute raised lines, and coarse distant plications, also by prominent spiral or longitudinal ridges. The minute transverse raised lines are generally curved concavely backward between each pair of spiral ridges. The transverse plications are from 1.75 to 2 centimetres apart on the body-chamber, and they become obsolete in the flattened central portion of the ventral region. On each side of the exposed portion of the outer volution there are four widely distant spiral ridges, but those on the dorsal half of the sides are closer together than those on the ventral. Each place, too, at which one of the transverse plications is crossed by a spiral ridge, is marked by a large, oblique, spout-shaped node or protuberance, which is open to the front and probably represents the base of an oblique spine.

Sutures of the septa nearly straight but faintly undulated on each side, and much closer together on the dorsum or inner border than on the ventral or outer. Siphuncle exogastric, situated near the margin of the venter, nearly cylindrical but not quite continuous, the segments between the septa being slightly disjointed or displaced.

Lake Winnipegosis, on a small island at the south end of Dawson Bay, D. B. Dowling, 1888 : one imperfect specimen. South east side of Dawson Bay, four or five miles north of Shoal River (five specimens) and west side of the same bay (one specimen) J. B. Tyrrell, 1889.

These specimens consist of casts of the interior and two natural moulds of the exterior of the shell. Figures 1 and 1a on Plate IX are different views of a wax impression of one of these moulds, and fig 2 on the same plate is a side view of the most perfect natural cast of the interior.

In its peculiar surface ornamentation, in the outline of its transverse section, and even in the position and other characters of its siphuncle, this species bears a singularly close resemblance to the shell here described as *Orthoceras Tyrrellii*, and so far, the two forms have always been found associated together. The only appreciable difference between them seems to be that *O. Tyrrellii* is a perfectly straight and slenderly elongated shelly cone, and *G. Canadense* a precisely similar cone coiled rather closely on itself and in the same plane. No specimens, however, in the collections made by Mr. Tyrrell and others from the Devonian rocks of Manitoba, that are accessible to the writer, show any intermediate gradation between these two species.

GYROCERAS FILICINCTUM. (N. Sp.)

(Plate IX, fig. 3.)

Shell resembling that of the preceding species, in external form, but much smaller, more slender, more closely coiled and increasing less rapidly in its lateral diameter.

Surface markings also similar to those of *G. Manitobense*, in a general way, but differing materially therefrom in the following particulars. In the present species the spiral ridges which cross the transverse plications, average seven in number on each side of the exposed surface of the outer volution, and not four as in *G. Manitobense* Although placed at somewhat irregular distances apart, the spiral ridges of *G. filicinctum* are closer together in the ventral region than on the sides, whereas the opposite is the case in *G. Canadense*. In the present species, too, each point of intersection of a transverse plication by one of the spiral ridges is marked by a simple node or pointed tubercle, which is longer than broad, and apparently neither hollow at the summit nor open to the front, as in *G. Manitobense*. Sutures of the septa arched concavely backward on the sides: siphuncle exogastric, ventral and nearly marginal.

West side of Dawson Bay, Lake Winnipegosis, at the mouth of the Red Deer River, J. B. Tyrrell, 1889: three specimens. in each of which a considerable portion of the test is well preserved. In one of these, which is not figured, there are nearly two complete volutions. The specific name here proposed is suggested by the numerous, close-set and transverse, thread-like raised lines which pass over the summits of all the spiral ridges and everywhere encircle the shell.

GYROCERAS SUBMAMILLATUM. (N. Sp.)

(Plate X, figs. 1 and 1a.)

Shell large, attaining to a maximum diameter of eight or nine inches or more, increasing very slowly in thickness and, in the few specimens collected, consisting of a little more than one complete volution, which is so coiled as to leave a wide space in the centre, filled only with rock and equal to one half of the maximum diameter. Ventral region of the posterior and decollated end of the outer volution separated from the dorsal border at the anterior end by a space nearly as broad as the dorso-ventral diameter posteriorly. Outline of transverse section varying in different specimens from nearly elliptical to obscurely rhomboidal, but with the lateral diameter always greater, and usually about one fourth greater, than the dorso-ventral: sides expanded, narrowly rounded or somewhat angular at or near their centre: venter and dorsum compressed convex, but in some specimens faintly subangular in the centre.

Surface markings unknown, no portion of the test being preserved, though in one specimen there are impressions of transverse striæ or lines of growth on the body-chamber. On casts of the interior, however, there is a single row of obscurely defined but very large and distant, slightly elevated sub-nodose prominences on or near the centre of each side, with correspondingly concave depressions between them. Sutures of the septa nearly straight: shape and position of the siphuncle unknown.

Snake Island, Lake Winnipegosis, Prof. H.Y. Hind, 1858: the specimen referred to by E. Billings on page 187 of Hind's Report of the Assiniboine and Saskatchewan Exploring Expedition as "a species of Nautilus or Gyroceras." Quite recently, one or two characteristic specimens of the same species have been obtained by members of the staff of the Geological Survey of Canada at each of the following localities: Steep Rock Point, Lake Manitoba, J. B. Tyrrell, 1888. Lake Winnipegosis: at the north end of Snake Island, D. B. Dowling, 1889; on the south-east side of Manitou Island, near Red Deer Point and on a small island seven miles to the south of Manitou Island, J. B. Tyrrell, 1889. Swan Lake, Manitoba, near the mouth of Swan River, J. B. Tyrrell, 1889: the specimen figured, which though larger, is not quite so perfect nor so well preserved as the one collected by Prof. Hind.

In the single row of large sub-nodose prominences on each side, this species bears a certain degree of resemblance to the *G Logani* of Meek, from the Devonian rocks of the Mackenzie River. The type and only specimen known of *G Logani*, which is a cast of the interior of the shell, is, however, less than half the size of the present species, it increases much more rapidly in its lateral diameter, its transverse section is not at all approaching to rhomboidal in outline, and the outer half of its sides, between the subnodose prominences, is said to be marked with "obtuse undefined ridges" which at first curve forward and outward, and ultimately "more or less backward," a feature of which no traces can be found in any specimen of *G. submamillatum.*

EXPLANATION OF PLATES.

With the exception of figure 4 on Plate VII, all the figures are of natural size.

PLATE IV.

STRINGOCEPHALUS BURTINI.

Fig. 1.—Lateral outline of the largest specimen collected, which has been abnormally flattened.

2.—Small specimen of transversely elliptical shape, with the beak of the ventral valve nearly symmetrical.

3.—A small specimen with longitudinally elliptical lateral outline, and nearly symmetrical beak in the ventral valve.

3a.—Profile view of No. 3, to show the depth through the closed valves.

4.—Small testiferous specimen, with the beak of the ventral valve curved slightly to the right.

4a.—Profile view of the same.

5.—A small specimen in which the beak of the ventral valve is curved slightly to the left.

6.—An elongated and somewhat distorted example resembling the *Uncites lævis* of McCoy in its obovate contour and strongly recurved beak.

7.—Specimen with most of the test preserved and showing the surface markings.

8.—Posterior end of a small specimen in which the beak of the ventral valve has been broken off transversely just far enough to shew the whole of the bifid cardinal process in the dorsal.

9.—A specimen in which a considerable portion of the exterior of the dorsal valve has been broken off in such a way as to expose nearly the whole of the broad loop in that valve.

(All the specimens represented in this plate are from the Devonian rocks of Lake Winnipegosis.)

PLATE V.

MODIOMORPHA ATTENUATA.

Fig. 1. —Side view of the most perfect specimen collected.
1a.—Outline of transverse section of the same, at the place indicated on figure 1 by the letter S.

MEGALODON SUBOVATUS.

Fig. 2.—Inner surface of an imperfect right valve of this species, with the test preserved.
2a.—Outer surface of the same specimen.
3.—Side view of a cast of the interior of the closed valves.
3a.—Cardinal view of the same.

ORTHONOTA CORRUGATA.

Fig. 4.—Side view of the most perfect specimen known to the writer.
4a.—Outline of a transverse section of the same, at the place indicated on figure 4 by the letter S.
5.—A broken specimen of the same species, with the test preserved and shewing the corrugations on the posterior area.

PLATE VI.

PLEUROTOMARIA GONIOSTOMA.

Fig. 1.—Front view. The spire drawn from a wax impression of the natural mould of that part of the shell, and the basal portion from the cast which fits into this mould and forms part of the same specimen.

EUOMPHALUS MANITOBENSIS.

Fig. 2.—Right side of an unusually perfect specimen, with some of the lines of growth preserved.
2a.—Left side of the same.
2b.—Front view of the same.
3.—Outer surface of the operculum of this species.
3a.—Profile view of the same operculum, to shew the amount of its convexity.

ACTINOCERAS HINDII.

Fig. 4.—A cast of the interior of the septate portion of the shell and of most of the body-chamber.
4a.—Outline of transverse section of the same at the place indicated in figure 4 by the letter S, and showing the position of the siphuncle.
5.—Longitudinal section of the specimen collected by Professor Hind, shewing the septa and the slightly beaded siphuncle at the anterior end of the septate portion of the shell.

PLATE VII.

ORTHOCERAS (THORACOCERAS) TYRRELLII.

Fig. 1.—The upper part drawn from a cast of the interior of the shell, and the lower from a gutta percha impression of a natural mould of the exterior.
1a.—Outline of transverse section of the same (at S.), shewing also the position of the siphuncle.
2.—Another specimen, shewing the shape of part of the siphuncle.
3.—Diagrammatic representation of the same part of the siphuncle.
4.—Small portion of the posterior or smaller end of another specimen, in which one of the spines is preserved. Three times natural size.

CYRTOCERAS OCCIDENTALE.

Fig. 5.—Side view of a cast of the interior of the shell.
5a.—Outline of transverse section of the same at S, shewing also the position of the siphuncle.
6.—Longitudinal section of part of the same, to show the nummuloidal character of the siphuncle.

GOMPHOCERAS MANITOBENSE.

Fig. 7.—Side view of the least distorted and most perfect specimen collected.
7a.—Outline of transverse section of the same, at S, shewing also the supposed position of the siphuncle.

PLATE VIII.

HOMALOCERAS PLANATUM.

Fig. 1.—Lateral outline of the type specimen.
1a.—Side view of a wax impression of part of the posterior end of the same, showing the crenate margin of the test on one side of the venter.
1b.—Ventral view of 1a.
1c.—Outline of transverse section of the shelly tube at the posterior end of the type specimen, shewing also the position of the siphuncle at that end.
1d.—Outline view of the posterior end of the cast of the body-chamber in the type specimen.

TETRAGONOCERAS GRACILE.

Fig. 2.—Lateral outline of the type and only known specimen.
2a.—Interior of venter of the same.
2b.—Outline of transverse section of the original of figure 2, at S.
(The position of the siphuncle is indicated in each of these figures.)

PLATE IX.

GYROCERAS CANADENSE.

Fig. 1.—Side view of a wax impression taken from a natural mould of the exterior of the shell of this species.
1a.—Ventral view of the same.
1b.—Outline of transverse section of the same at S. shewing the position of the siphuncle.
1c.—Diagrammatic representation of the anterior end of the siphuncle of the same.
2.—Side view of a cast of the interior of the shell of another specimen.

GYROCERAS FILICINCTUM.

Fig. 3.—Side view of one of the most perfect specimens described.

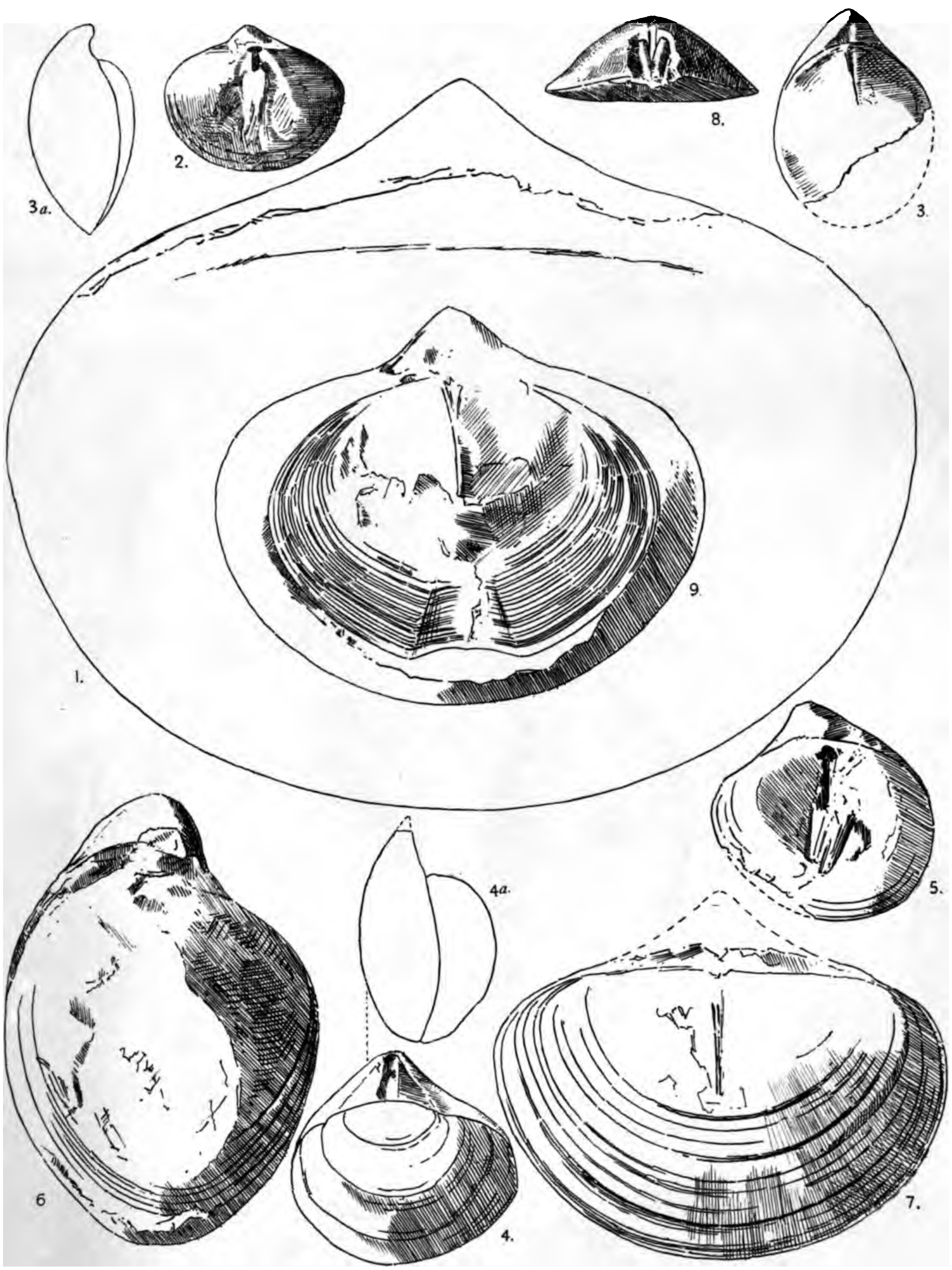
PLATE X.

Fig. 1.—Sid
1a.—O

DEVONIAN FOSSILS OF MANITOBA.

Trans. R. S. C., 1890.

Section IV. Plate IV.



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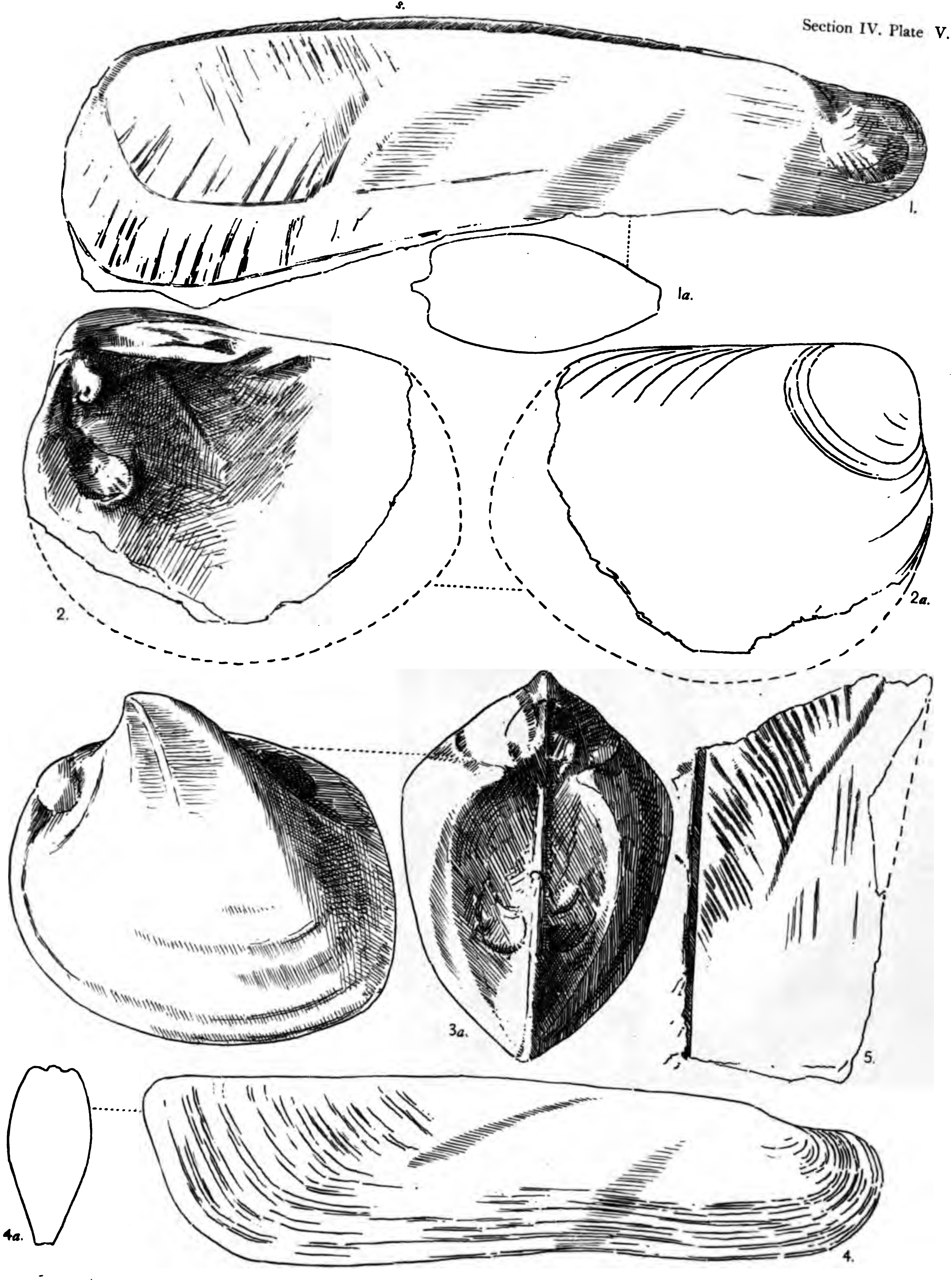

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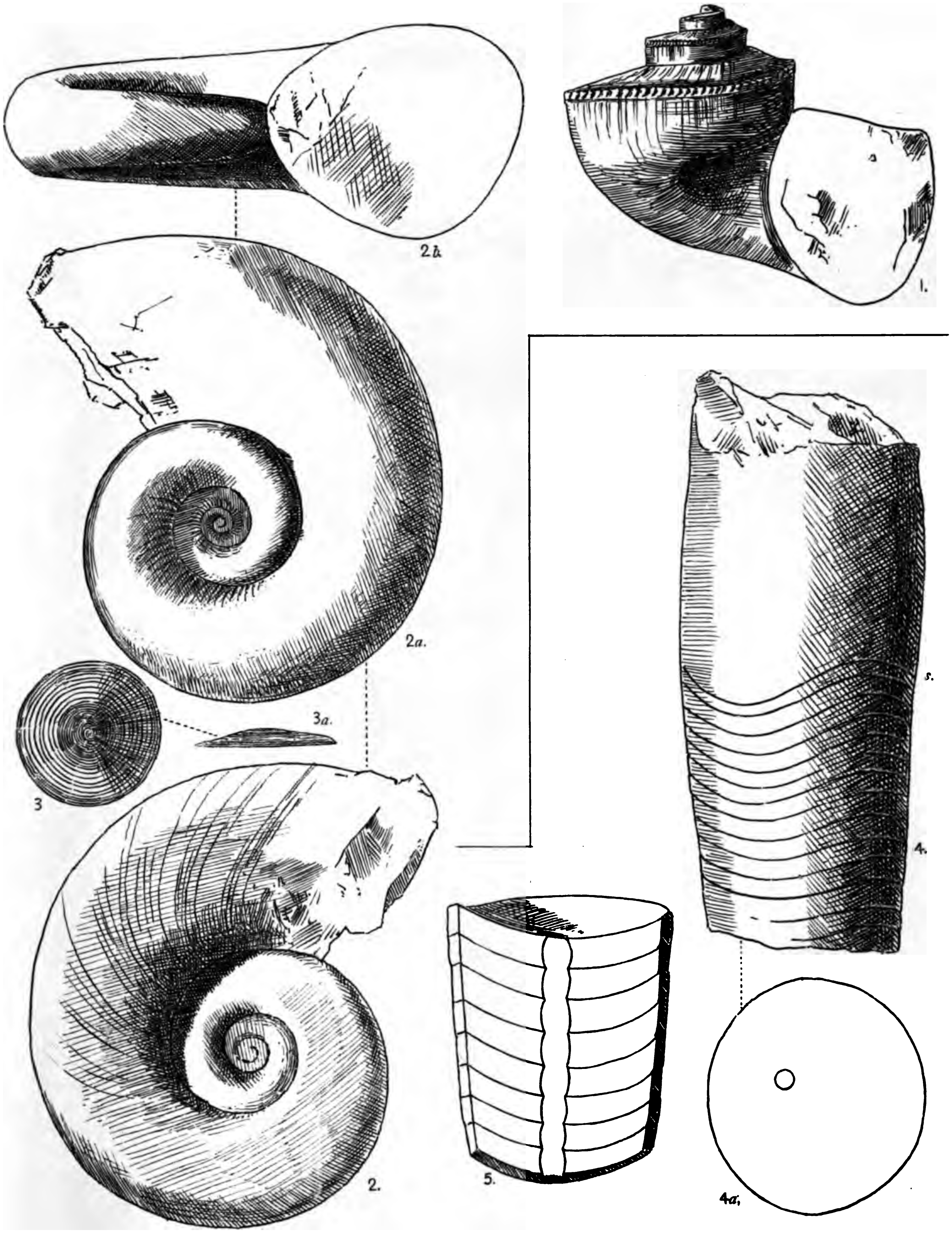

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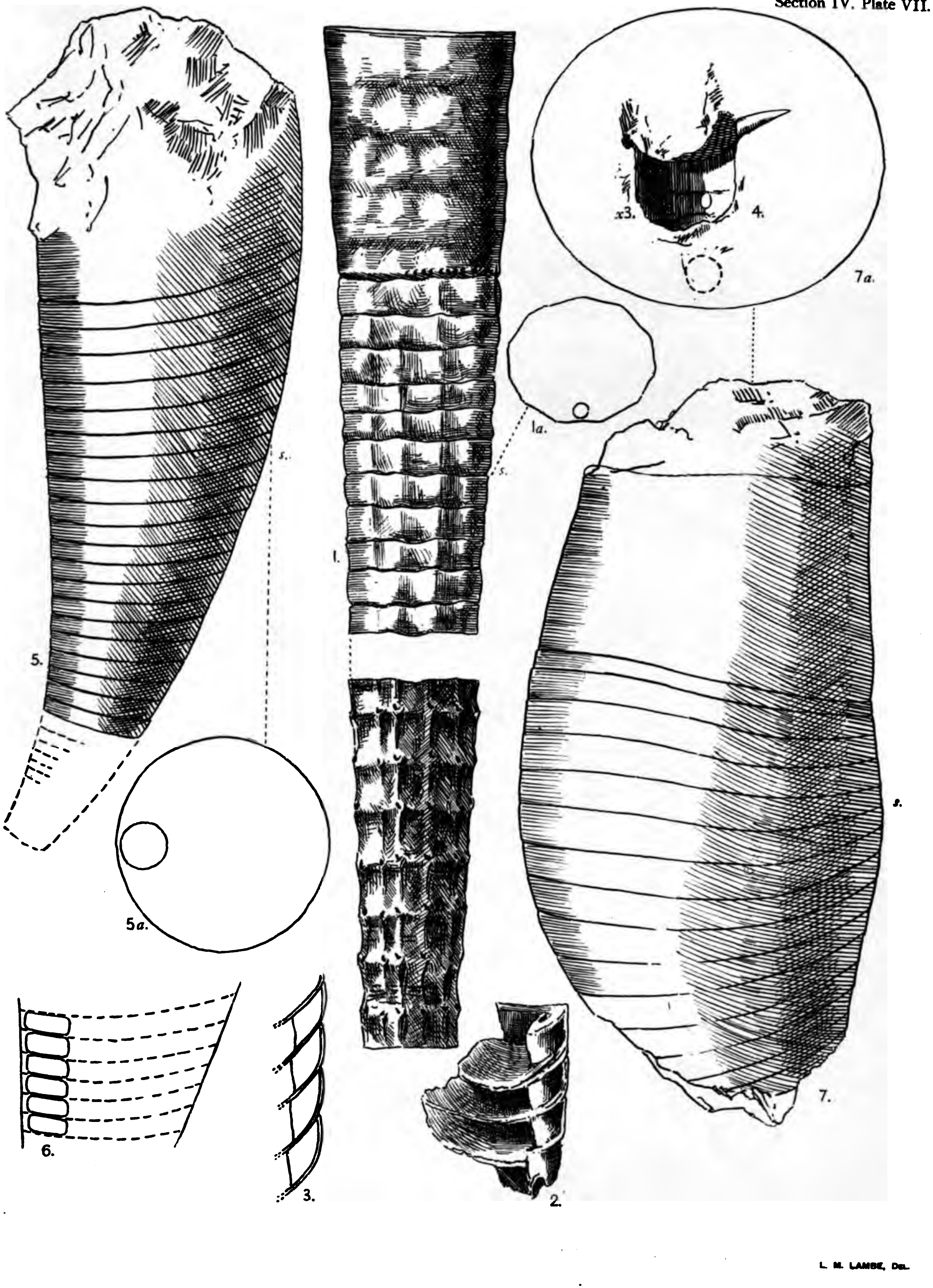

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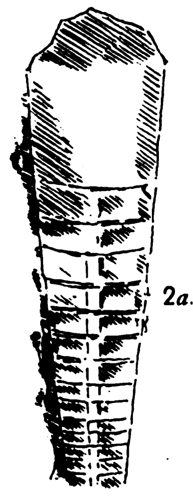

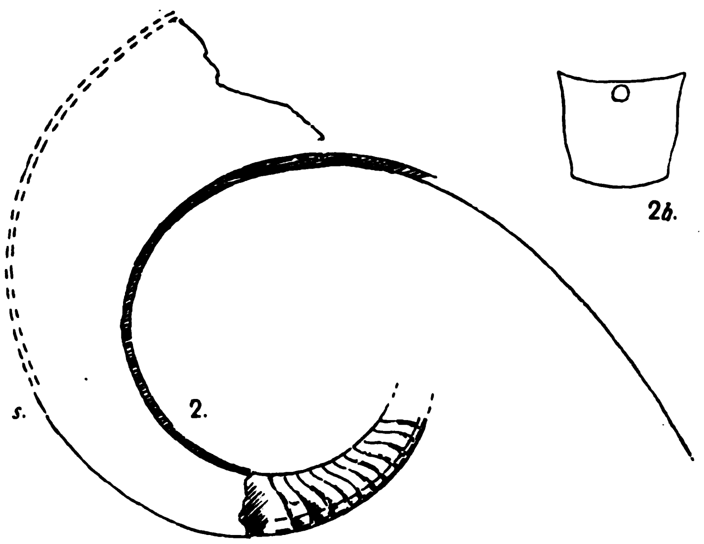

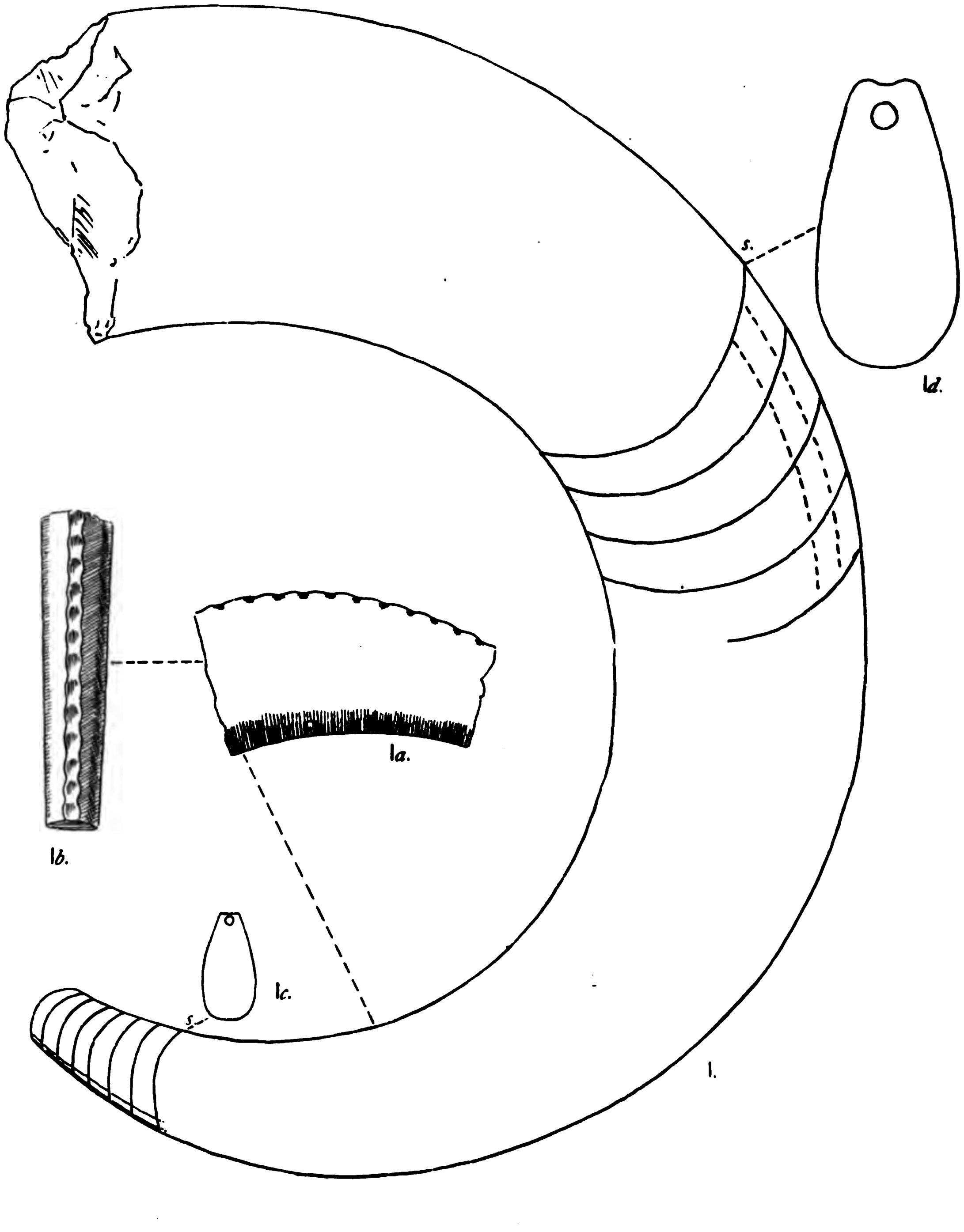

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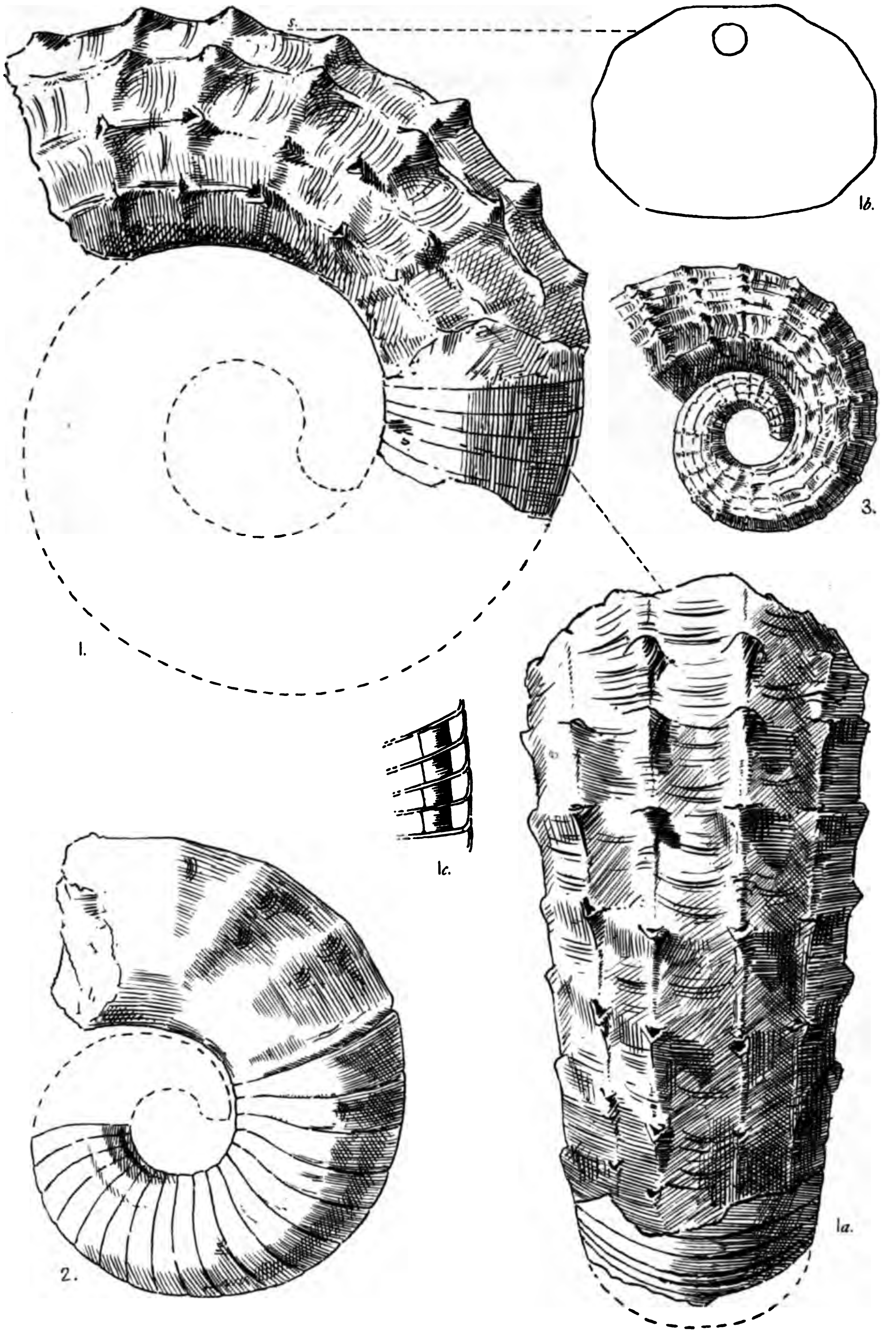

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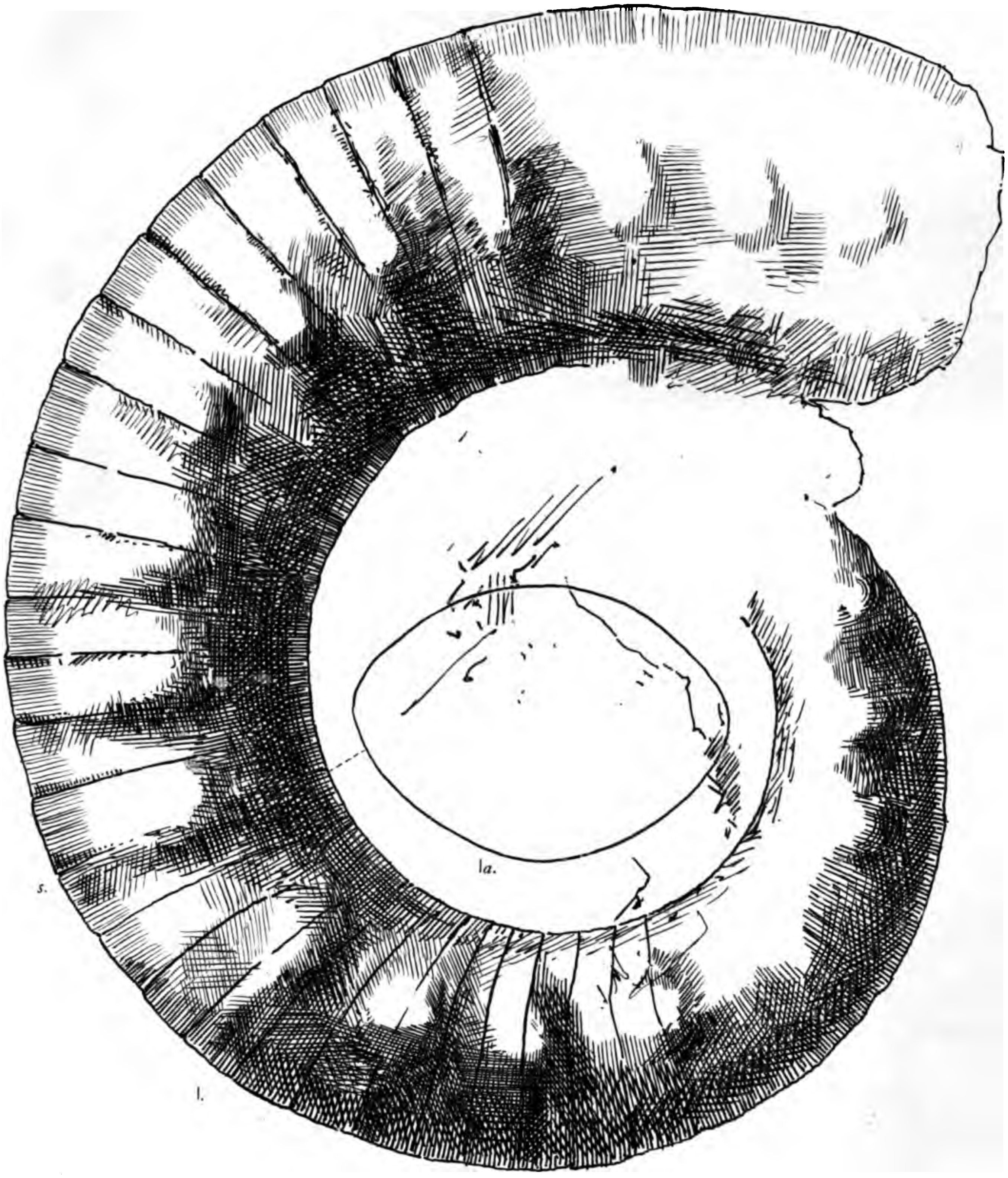
Sec. IV. Plate X.



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